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Eastern Pacific Expeditions of the New York Zoological Society.
 XLVI. Oxystematous and Allied Crabs from the West
 Coast of Tropical America.^{1, 2}

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(Text-figures 1 & 2)

[This is the forty-sixth of a series of papers dealing with the collections of the Eastern Pacific Expeditions of the New York Zoological Society made under the direction of William Beebe. The present paper is concerned with specimens taken on the Templeton Crocker Expedition (1936) and the Eastern Pacific "Zaca" Expedition (1937-1938). For data on localities, dates, dredges, etc. refer to *Zoologica*, Vol. XXII, No. 2, pp. 33-46, and Vol. XXIII, No. 14, pp. 287-298.]

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INTRODUCTION

THE oxystematous crabs of the families Dorippidae, Leucosiidae, and Calappidae, together with the allied crabs of the families Dromiidae and Dynomenidae, constitute the subject matter of this report, the third in a series dealing with the crabs of the Eastern Pacific Expeditions of the New York Zoological

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Society. Unlike the previous two, which were based on non-intertidal brachygnaths (Garth, 1959, 1961b), the intertidal brachygnaths having been previously reported upon (Crane, 1947), the present report covers both subtidal and intertidal forms. It has therefore been given a different title and is not designated as part 3. The general statements made in the introductory sections of part 1 and part 2 nevertheless apply, and will be supplemented only as required by the group under consideration.

The oxystomatous and allied crabs of America were the subject of monographic treatment as recently as 1937, while the "Zaca" Expedition was in progress. Prior to this time the waters of the eastern Pacific had been plied by the "Velero III", the oxystomatous crabs receiving the personal attention of Dr. Waldo L. Schmitt, member of the Hancock Expeditions of 1933-34-35, who saw that they came to the notice of the late Dr. Mary J. Rathbun, who described them in two preliminary papers (Rathbun, 1933, 1935). Those that escaped immediate description were either described in the monograph referred to (Rathbun, 1937) or subsequently by the writer (Garth, 1940). Therefore, although the "Zaca" did as well in collecting this group as any other, the 28 species obtained were already described or in process of description, the single exception being the *Clythrocerus* species described herein. Attention was therefore directed towards the brachygnathous groups, which had not been monographed as recently, with the result that the oxystomatous crabs and their allies, although first in the systematic arrangement, are the last to be reported upon.

ECOLOGICAL CONSIDERATIONS

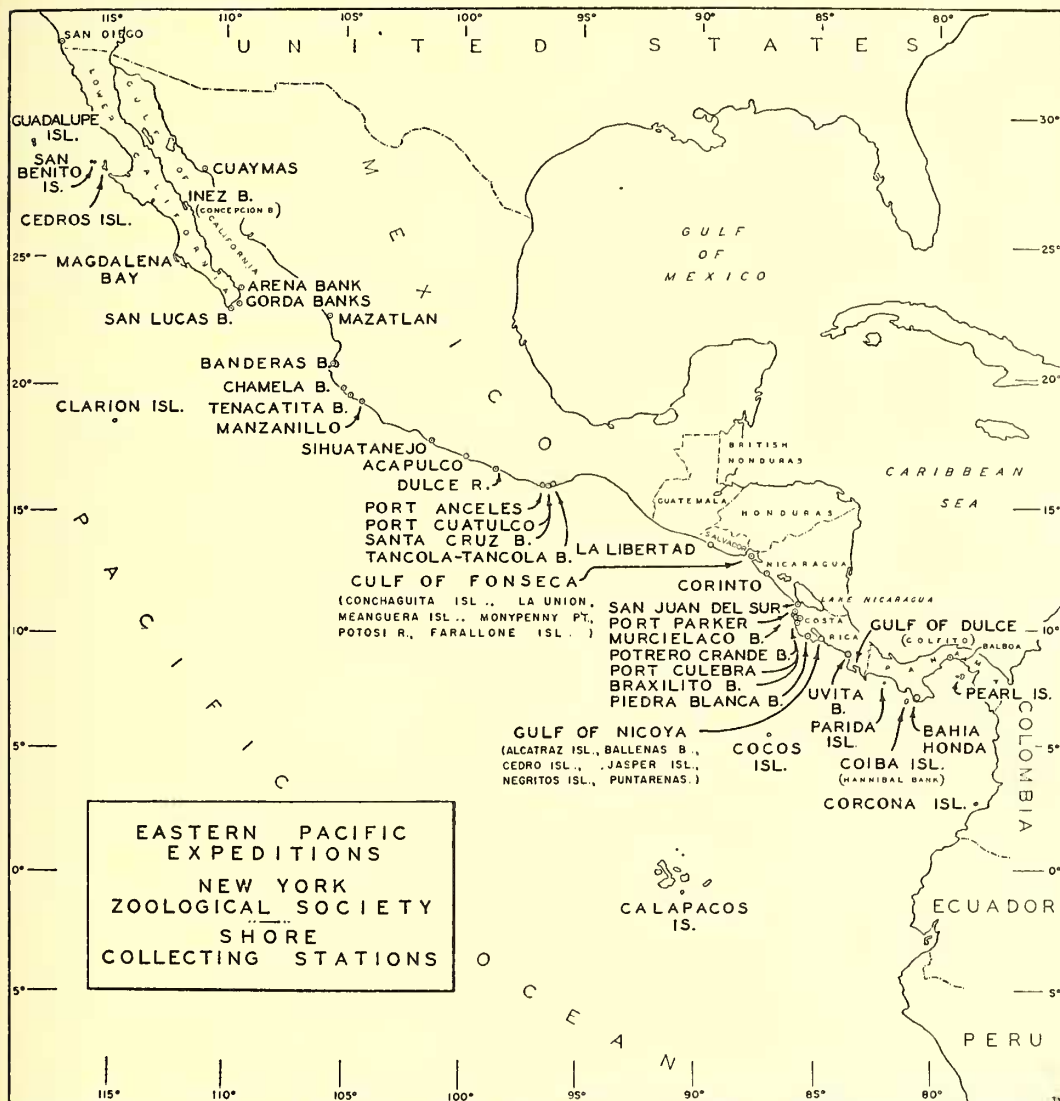
The field notes of Miss Jocelyn Crane have been quoted extensively. These, while not as detailed as for some of the groups more readily accessible to direct observation, nevertheless serve to provide a useful frame of reference. Color in life is recorded for 14 of the 28 species, while aquarium behavior is recorded for *Randallia ornata* and *Cycloes bairdii*. The use of *Calappa convexa* as food and its method of capture by native divers are reported. The placement of sea anemones carried as commensals by *Hepatus kossmanni* is noted, as is the infestation of this species by a rhizocephalan parasite. The pelecypod shells used as cover by *Hypoconcha panamensis* have been identified as *Glycymeris multicostata* (Sowerby) and *Papyridea aspera* (Sowerby). While the great majority of species was obtained by shallow dredging, *Uhlias ellipticus*, heretofore regarded as an intertidal form, was found in coral obtained by diving. Also,

since no station number or depth is given, it is assumed that specimens of *Leucosilia jurinei* were collected ashore. Breeding season is inferred from the presence of ovigerous females. These were encountered for eight species in the November-January period, with a concentration in mid-December, and for three species in March.

GEOGRAPHICAL CONSIDERATIONS

The ranges of most of the species treated are coextensive with the limits of the Panamic faunal province, or from Magdalena Bay (exceptionally, Cedros Island), Lower California, Mexico, to Santa Elena Bay, Ecuador (exceptionally, Sechura Bay, Peru). To these ranges the records of the "Zaca" can add little, since her activities fell well within these limits (See text-fig. 1). However, where species are known from such widely separated localities as the Bay of Panama and the Gulf of California, often with but a single record from each, the "Zaca" collections help to obliterate the apparent discontinuities by filling in the intermediate localities, usually from the southern end. Thus the range of *Ethusa ciliatifrons*, known previously from the Bay of Panama, is extended northward to the Gulf of Nicoya, Costa Rica, in the direction of its recently reported occurrence in the Gulf of California (Garth, 1961a), while the range of *Ilicantha schmitti*, known previously from Ecuador and Colombia (Rathbun, 1937), is similarly extended northward to Judas Point, Costa Rica. Again bridging gaps in existing ranges, a "Zaca" record for *Uhlias ellipticus* provides the first continuity between the type locality, Panama, and San José Island, Gulf of California (Rathbun, 1937), while a series of stations in Nicaragua, El Salvador, and Guatemala provides stepping-stones for *Persephona edwardsii* between the type locality, Panama, and Punta Piaxtla, Mexico (Garth, 1946). The new species of *Clythrocerus* described below fills a hiatus in the distribution of that genus in the eastern Pacific, where it is now represented by *C. planus* off southern California-northern Lower California, *C. laminatus* in the Galapagos Islands, and the new species off Central America.

Species collected by the "Zaca" that occur also in the Atlantic are *Cycloes bairdii* and *Ethusa mascarone* (the *americana* form). Species for which Rathbun (1937, p. 5) recognized Atlantic analogues are *Dromidia laraburrei* (*D. antillensis*); *Hypoconcha panamensis* (*H. arcuata*); *Ethusa mascarone panamensis* (*E. m. americana*), *E. lata* (*E. microphthalmia*); *Ebalia magdalenensis* (*E. cariosa*); *Uhlias ellipticus* (*U. limbatus*); *Ilicantha hancocki* (*I. liodactylus*), *I.*



TEXT-FIG. 1. Shore collecting stations of the Eastern Pacific Expeditions of the New York Zoological Society. For exact locations of associated dredge stations, refer to *Zoologica*, vol. XXII, no. 2, and vol. XXIII, no. 14.

schmitti (*I. sparsa*); *Calappa convexa* (*C. flamma*), *C. saussurei* (*C. angusta*); *Hepatus kossmani* (*H. princeps*). The writer would propose the pairing *O. sona* (*O. antillensis*) rather than the suggested *O. galapagensis* (*O. antillensis*) on geographical as well as morphological grounds. The genus *Hepatella* is restricted to the west coast of America; the relationships of *Dynomene*, *Lithadia*, and *Mursia* are with the Indo-west Pacific.

SYSTEMATIC CONSIDERATIONS

The 28 species of oxystomatous and allied

crabs here reported may be divided as follows: of the subsection Dromiacea, superfamily Dromiidea, 3 species, of which 2 belong to the family Dromiidae and one to the family Dynomenidae; of the subsection Oxystomata 25 species, of which 4 belong to the family Dorippidae (including the new *Clythrocerus*), 12 to the family Leucosiidae, and 9 to the family Calappidae. Of the Leucosiidae, the genus *Randallia* is represented by 4 species, the genera *Persephona* and *Iliacantha* by 2 each, while of the Calappidae the genus *Osachila* is represented by 3 species, the genus *Calappa* by 2. Such extensive sympatry is

indicative of a multiplicity of ecological niches among which the dredge as a collecting tool fails to discriminate.

Species reported for the first time since the types are the leucosiid *Randallia minuta* and the calappid *Osachila sona*. Described as new to science is the dorippid *Clythrocerus edentatus*, which like its congeners has the last two pairs of walking legs modified for carrying a fragment of shell as covering. Because of the excellent systematic treatment provided by Rathbun (1937) and the well defined generic limits within the group, no new combinations are required. The synonymy used is largely that of Rathbun.

RESTRICTION OF SYNONYMIES

Following the format established in the earlier parts of this series, the synonymies are restricted to (1) the original description, (2) the first use of the name in present combination, and (3) the citation placing the species within the territory considered, if not included in the above two. Reference is made to the Rathbun (1937) monograph as containing the complete synonymy, and to any reported occurrence since that date, to and including Garth (1961a).

EXPLANATION OF MEASUREMENTS

Standard measurements are those of length and breadth of carapace. Length does not include the posterior spine of the Leucosiidae. In the case of *Mursia* of the Calappidae breadth is given both with (and without) the lateral spine.

ACKNOWLEDGMENT

In addition to those to whom gratitude was expressed in the earlier reports of this series, the writer is indebted to the late Dr. Norman T. Mattox for the identifications of the pelecypod shells used as covering by *Hypoconcha panamensis* and to Mr. Timothy Wyatt for preparing the illustration of the *Clythrocerus* species.

SYSTEMATIC DISCUSSION

Section BRACHYURA

Subsection DROMIACEA

Superfamily DROMIIDEA

Family DROMIIDAE

Dromidia larraburei Rathbun

Dromidia sarraburei Rathbun, 1910, p. 553, pl. 48, fig. 4. (Error for *larraburei*).

Dromidia larraburei, Schmitt, 1921, p. 183, pl. 33, fig. 1. Rathbun, 1937, p. 35, text-fig. 13, pl. 7, figs. 4, 5, synonymy. Crane, 1937, p. 106. Garth, 1946, p. 346, pl. 61, figs. 1, 2.

Range: From Monterey Bay, California, to Sechura Bay, Peru. Galapagos Islands. Shore to 60 fathoms. (Garth).

Material examined: SE of Cedros Island, Lower California, Mexico, November 10, 1937, Station 126, D-19, 25 fathoms, 1 male.

Measurements: Male specimen, length 18.6 mm., width 19.4 mm.

Habitat: Rocks, algae.

Color in life: Buff. Chelae tipped with coral red. Eyes black; 2 black spots side by side on intestinal region. (J. Crane, field notes).

Remarks: The specimen, which was kept in an aquarium, was dead the next morning. (J. Crane, field notes).

Hypoconcha panamensis Smith

Hypoconcha panamensis Smith, 1869, p. 249. Rathbun, 1937, p. 47, pl. 9, figs. 6, 7. Garth, 1946, p. 348, pl. 61, figs. 3, 4; 1948, p. 16; 1961a, p. 121.

Range: From Rocky Point (Punta Peñasco), Gulf of California, Mexico (Garth, 1961a), to Matapalo, Peru. Galapagos Islands. 3-100 fathoms. (Garth, 1948).

Material examined: 9 specimens from 4 stations:

Mexico

Manzanillo, November 22, 1937, Station 184, D-1, 25 fathoms, 2 males.

Costa Rica

Port Parker, Station 203, January 20, 1938, D-2, D-3, 10-12 fathoms, 2 males; January 22, 1938, D-9, 1.5-4 fathoms, coral, 1 female.

Cedro Island, Gulf of Nicoya, February 13, 1938, Station 213, D-1 to D-10, 4-10 fathoms, 1 male.

Panama

Hannibal Bank, March 20, 1938, Station 224, D-3, 35 fathoms, 2 males, 1 female.

Measurements: Males from 6.6 × 6.4 to 27.2 × 28.1 mm., females from 6.4 × 6.7 mm. to a size comparable to the largest male, but unmeasurable because of its soft-bodied condition.

Habitat: Sand, mud; shelly sand, shelly mud; crushed shells; algae; coral.

Color in life: Of Manzanillo, Mexico, males:

Above and below white mottled with pink; pile buff. (J. Crane, field notes).

Remarks: The pink mottling of the crabs themselves resembled the patches of coralline algae found on their shell covers. The pelecypod shells inhabited by the Manzanillo and Hannibal Bank specimens were preserved and have been identified by Dr. Norman T. Mattox as *Glycymeris multicostata* (Sowerby) and *Papyridea aspera* (Sowerby), respectively.

Family DYNOMENIDAE

Dynomene ursula Stimpson

Dynomene ursula Stimpson, 1860, p. 239. Rathbun, 1937, p. 54, pl. 12, figs. 1-4. Garth, 1946, p. 349, pl. 61, figs. 5, 6; 1948, p. 16; 1961a, p. 121. Schmitt, 1939, p. 25.

Range: From Espiritu Santo Island, Gulf of California, Mexico (Garth, 1961a), to La Plata Island, Ecuador. Galapagos Islands. Shore to 70 fathoms. (Garth, 1948).

Material examined: 2 specimens from as many stations:

Mexico

3 mi. off Pyramid Rock, Clarion Island, May 12, 1936, Station 163, D-2, 55 fathoms, 1 female.

Panama

Hannibal Bank, March 20, 1938, Station 224, D-1 to D-3, 40-35 fathoms, 1 female.

Measurements: Females 5.8×7.6 and 7.1×8.2 mm.

Habitat: Rocks, dead coral; mud, sand, shells. (The former more probable.)

Remarks: Since this species is invariably associated with rocky shore or coral, it is believed that the bottom data for D-1 and D-2 of Station 224 apply, rather than those of D-3. The bottom type of Station 163 is not given.

Subsection OXYSTOMATA

Family DORIPPIDAE

Ethusa mascarone panamensis Finnegan

Ethusa mascarone americana, Rathbun, 1898, p. 615. Not *E. americana* A. Milne Edwards.

Ethusa mascarone var. *panamensis* Finnegan, 1931, p. 616.

Ethusa mascarone panamensis, Rathbun, 1937, p. 79, pl. 22, fig. 1, pl. 23, fig. 1.

Range: From Isabel Island, Mexico, to La Libertad, Ecuador. Low tide to 25 fathoms. (Rathbun, 1937).

Material examined: 15 specimens from 10 stations:

Mexico

Manzanillo, November 22, 1937, Station 184, D-2, 30 fathoms, 1 male.

Port Guatulco, December 4, 1937, Station 195, D-2, 3 fathoms, 1 male.

Tangola-Tangola Bay, December 12, 1937, Station 196, D-14, 5 fathoms, 1 male.

El Salvador

Meanguera Island, Gulf of Fonseca, December 23, 1937, Station 199, D-1, 16 fathoms, 3 females (1 ovigerous).

Nicaragua

Corinto, Station 200, December 29, 1937, D-1, 6.5 fathoms, 1 male; January 7, 1938, D-27, 3 fathoms, 1 male.

Costa Rica

Port Parker, January 22, 1938, Station 203, D-11, 2-4 fathoms, 1 ovigerous female.

Murcielago Bay, January 23, 1938, Station 204, D-4, 2 fathoms, 1 male.

Piedra Blanca Bay, February 5, 1938, Station 208, [D-1 to D-10], [2-6 fathoms], 1 male.

Cedro Island, Gulf of Nicoya, February 13, 1938, Station 213, D-1 to D-10, 4-10 fathoms, 2 females, 1 young.

Golfoito, Gulf of Dulce, March 9, 1938, Station 218, D-4, 6 fathoms, 1 young.

Measurements: Males from 4.9×4.0 to 9.4×8.4 mm., females from 5.7×5.1 to 9.2×8.3 mm., ovigerous female 7.8×7.0 mm., young from 3.3×2.9 mm.

Habitat: Sand, often with mud and crushed shell; mangrove leaves; rocks, sand, and algae. Sand appears the common constituent, as was mud with *Ethusa lata*.

Breeding: Costa Rica in late January.

Remarks: In the few instances in which young and adults occur in the same lot, as at Cedro Island, Gulf of Nicoya, it was noted that the larger specimens had the exorbital spine directed obliquely outward and that in at least one specimen it was as long as any of the frontal spines, or, typically *Ethusa mascarone americana* A. Milne Edwards. When it is recalled that Finnegan's specimen measured only 5.0×4.0 mm. and was therefore probably immature, it seems advisable either that the two presently recognized subspecies should be redefined on other characters, or that only one subspecies of *Ethusa mascarone* should be recognized from the eastern Pacific. The male from Corinto was particularly granulate on the protuberances of the carapace, and males of 5.8 mm. length and over showed unequal chelae.

***Ethusa lata* Rathbun**

Ethusa lata Rathbun, 1893, p. 258; 1937, p. 84, text-fig. 19, pl. 24, fig. 1, pl. 25, fig. 1, pl. 28, fig. 3. Crane, 1937, p. 105. Garth, 1946, p. 352, pl. 60, fig. 3; 1948, p. 17.

Range: From Cedros Island, west coast of Lower California, and San Felipe Bay, Gulf of California, Mexico, to La Plata Island, Ecuador. Galapagos Islands. 2-100 fathoms. (Garth, 1948).

Material examined: 18 specimens from 5 stations.

Mexico

17 mi. SE × E of Acapulco, November 29, 1937, Station 189, D-4, 28 fathoms, 1 female.

Port Guatulco and Santa Cruz Bay, December 7, 1937, Station 195, D-19 to D-21, 17-23 fathoms, 2 males, 2 females.

Tangola-Tangola Bay, December 13, 1937, Station 196, D-17, 23 fathoms, 3 males, 6 females.

Costa Rica

Port Parker, January 20, 1938, Station 203, D-2, D-3, 10-12 fathoms, 2 males, 1 female.

Port Culebra, January 30, 1938, Station 206, D-1, D-3, 14 fathoms, 1 female.

Measurements: Males from 5.3 × 5.5 to 10.3 × 11.2 mm., females from 4.9 × 5.1 to 15.0 × 17.0 mm., the latter post-ovigerous.

Habitat: Mud, sandy mud, gravelly mud; shell sand; crushed shell; algae.

Color in life: Of Port Guatulco, Mexico, male: Brownish gray. (J. Crane, field notes).

Of Gulf of Fonseca, El Salvador, females: Cream mottled with brown; eggs crimson. (J. Crane, field notes).

Breeding: El Salvador in late December.

Remarks: The 15.0 × 17.0 mm. female, while of good size, is not as large as the 26 × 29 mm. female type of *Aethusa pubescens* Faxon, a synonym of *Ethusa lata* Rathbun. A female of 9.9 × 10.4 mm. dimensions was also noted as having borne ova. The variety of habitats shown above is perhaps misleading. Mud was the common constituent of all bottoms on which *E. lata* was dredged. For color, food, and breeding see Crane (1937).

***Ethusa ciliatifrons* Faxon**

Ethusa ciliatifrons Faxon, 1893, p. 159; 1895, p. 34, pl. 5, figs. 3, 3a, 3b. Rathbun, 1937, p. 88, text-fig. 20, pl. 24, fig. 2, pl. 25, fig. 2, pl. 28, fig. 4. Garth, 1961a, p. 121 (by error *Ethusina ciliatifrons* on p. 120).

Range: Bay of Panama, 127-259 fathoms.

(Faxon, 1893). Off Rio San Lorenzo, Gulf of California, 42-48 fathoms. (Garth, 1961a).

Material examined: Off Ballenas Bay, Gulf of Nicoya, Costa Rica, February 25, 1938, Station 213, D-15, D-16, 40-45 fathoms, 2 males, 1 female.

Measurements: Males 13.8 × 14.7 and 20.6 × 22.5 mm., female 25.3 × 28.3 mm.

Habitat: Mud bottom.

Remarks: The specimens are of goodly size as compared with specimens of *Ethusa lata* and *E. mascarone panamensis*. None is as large, however, as the 26.5 × 29.5 mm. male cotype (M.C.Z. No. 4498). Apart from a single record from the Gulf of California resulting from the Vermilion Sea Expedition of the Scripps Institution of Oceanography (Garth, 1961a), the species has not been reported since the type specimens were obtained by the "Albatross" in 1891. The "Zaca" Expedition and the Vermilion Sea Expedition records are from comparable depths and together extend the bathymetric range from the 127-259 fathoms of the "Albatross" stations shoalward to the 40-48 fathom bracket.

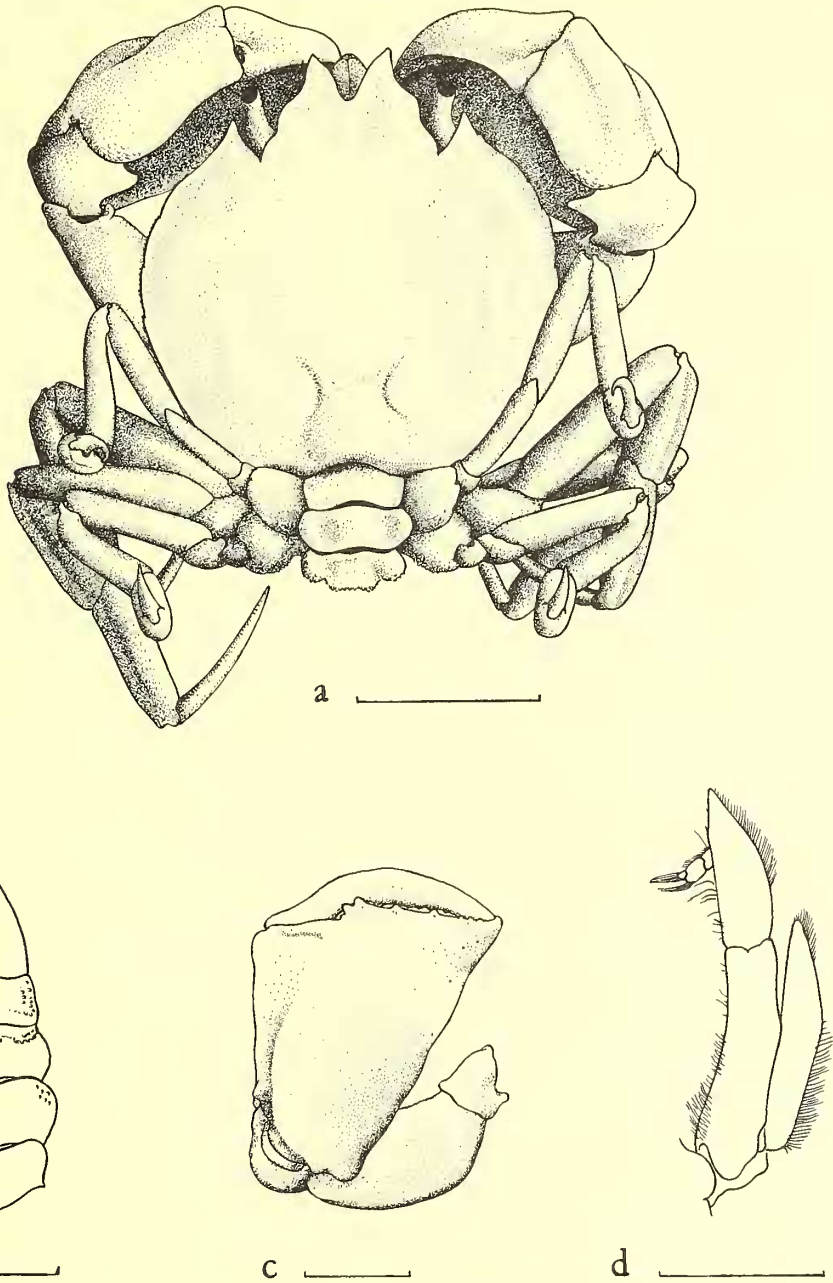
Clythrocerus edentatus*, new species*Text-fig. 2**

Type: Male holotype, A.H.F. No. 378, and two male paratypes, N.Y.Z.S. No. 37,691, from Meanguera Island, Gulf of Fonseca, El Salvador, December 23, 1937, "Zaca" Station 199, D-1, 16 fathoms.

Measurements: Male holotype, length including frontal teeth 3.8 mm., without frontal teeth 3.4 mm., width 4.1 mm., exorbital width 2.6 mm., length of chela (lower margin) 3.0 mm., length of dactyl 2.2 mm., height of palm 2.0 mm.

Diagnosis: Carapace wider than long. No lateral tooth or spine. Propodal finger of cheliped truncated, dactylar finger strongly curved downward.

Description: Carapace broader than long even when frontal teeth are included. Dorsal surface flattened medially, gently sloping laterally towards postlateral margins, granulate only at edges; furrows, with the exception of those outlining cardiac region, obliterated. Frontal teeth narrow, inner margins convex, outer margins concave, tips rounded, inclining outwards, the quadripartite extension of the buccal frame visible in the U-shaped hiatus between. Inner orbital margin continuous with broadly curving front, obliterating inner orbital tooth; outer orbital tooth acute, an open fissure between. Lateral margins irregularly scalloped anteriorly, a suggestion of an indentation, but no tooth, at



TEXT-FIG. 2. *Clythrocerus edentatus*, male holotype; a, dorsal view; b, abdomen; c, right cheliped; d, left outer maxilliped. Timothy Wyatt, del. (Scale of a, 2 mm.; scale of b, c, and d, 1 mm.).

widest portion of carapace. Pterygostomian region sharply granulate; an infraorbital spine or tooth.

Chelipeds massive, subequal, carpus broader than long, outer margin rectangular, inner margin bearing a blunt tooth. Chelae swollen, palms widening distally, lower margin straight or slight-

ly sinuous, inner surface concave, upper surface at right angles to outer, marked by a low ridge with a proximal tubercle, a similar ridge, inflated proximally, on outer surface. Fixed finger stout, truncated, occupying two-thirds height of palm, minutely denticulate, and closing with two or three basal denticles overlapping base of mov-

able finger, which is slender, denticulate, and strongly bent downward.

External maxillipeds with meri narrowing anteriorly and forming with the similarly attenuated epistome a projection visible dorsally between the rostral teeth.

Third visible segment of male abdomen tripartite in dorsal view and ornamented with sharp granules. The female of the species is unknown.

Remarks: The new species differs from all other American species of *Clythrocerus* in having no lateral spine or tooth. It differs from *C. laminatus* Rathbun of the Galapagos Islands (see Garth, 1946, pl. 50) in having the frontal teeth slender instead of broad, their tips rounded instead of sub-acute, the orbits internally confluent with the front instead of presenting a small, rectangular inner orbital tooth, the inner carpal projection of the cheliped a blunt tooth instead of a rectangular plate, the propodal finger truncated instead of attenuated and of equal length to the dactylar finger, and the latter curved strongly downward instead of only slightly so.

The new species also fills a gap in the eastern Pacific distribution of the genus, no member of which has been reported heretofore from along the Central American mainland coast. It is the second new species to have come from Station 199, the other being *Heterocrypta craneae* (Garth, 1959).

Family LEUCOSIIDAE

Ebalia magdalenensis Rathbun

Ebalia magdalenensis Rathbun, 1933, p. 334, pl. 22; 1937, p. 128, text-fig. 34, pl. 35, figs. 4, 5. Garth, 1961a, p. 121.

Range: From Scammon Lagoon, Lower California, and Rocky Point (Punta Peñasco), Gulf of California, Mexico (Garth, 1961a), to La Libertad, Ecuador. 2-18 fathoms. (Rathbun, 1937).

Material examined: 5 specimens from 2 stations:

Costa Rica

Port Parker, January 20, 1938, Station 203, D-2, D-3, 12 fathoms, 1 male, 1 female.

Cedro Island, Gulf of Nicoya, February 13, 1938, Station 213, D-1 to D-10, 8 fathoms, 1 male, 2 females.

Measurements: Males from 6.0×6.0 to 7.8×7.6 mm., females from 5.6×5.7 to 8.3×8.5 mm.

Habitat: Shelly mud; mud, sand, and crushed shell.

Remarks: Specimens from Port Parker were collected in the same dredge hauls with *Lithadia*

cumingii Bell. Specimens from Cedro Island, Gulf of Nicoya, are more granulate than Port Parker specimens, especially on the ridges of the carapace and on the legs.

Lithadia cumingii Bell

Lithadia cumingii Bell, 1855, p. 305, pl. 33, figs. 6, 7. Rathbun, 1937, p. 136, pl. 38, figs. 1, 2, 7-15. Crane, 1937, p. 102. Garth, 1946, p. 356, pl. 62, fig. 1; 1961a, p. 121.

Range: From Magdalena Bay, Lower California, and George Island, Gulf of California, Mexico (Garth, 1961a), to La Plata Island, Ecuador. Galapagos Islands. 2-51 fathoms.

Material examined: 6 specimens from 3 stations.

Mexico

Manzanillo, November 22, 1937, Station 184, D-2, 30 fathoms, 1 male, 2 females (1 ovigerous).

El Salvador

Meanguera Island, Gulf of Fonseca, December 23, 1937, Station 199, D-1, 16 fathoms, 1 male.

Costa Rica

Port Parker, January 20, 1938, Station 203, D-2, D-3, 12 fathoms, 1 male, 1 female.

Measurements: Males from 7.8×8.6 to 12.3×15.2 mm., females from 3.9×4.7 (young) to 12.8×16.5 mm., ovigerous female 12.0×14.8 mm.

Habitat: Gravelly sand; shelly mud; sand, mud, and crushed shell.

Color in life: Of Manzanillo, Mexico, specimens: Buffy brown; rostral region darker; eggs coral red. (J. Crane, field notes).

Of Gulf of Fonseca, El Salvador, male: Brown blotched with black; chelipeds brown except abruptly black manus. Ambulatories and underparts black. (J. Crane, field notes).

Breeding: West coast of Mexico in late November.

Uhlias ellipticus Stimpson

Uhlias ellipticus Stimpson, 1871, p. 117, Rathbun, 1937, p. 149, pl. 36, figs. 1, 2. Garth, 1946, p. 357, pl. 60, figs. 4, 5.

Range: From San José Island, Gulf of California, Mexico, to Panama. Galapagos Islands. Intertidal. (Garth, 1946).

Material examined: Port Guatulco, Mexico, December 6, 1937, Station 195, D-15, diving, 1.5 fathoms, 1 male, 1 female.

Measurements: Male 4.4×6.7 mm., female 4.4×6.75 mm.

Habitat: From coral obtained by diving.

Remarks: This diminutive species has not been reported previously from the Mexican mainland, nor has it been taken previously from coral.

***Persephona edwardsii* Bell**

Persephona edwardsii Bell, 1855, p. 294, pl. 31, fig. 8. Rathbun, 1937, p. 154, pl. 45, figs. 3, 4. Garth, 1946, p. 358; 1961a, p. 121. Not Boone, 1930, p. 53, fig. A.

Range: From Santa Maria Bay, Lower California, Mexico (Garth, 1961a), to Cape San Francisco, Ecuador. 2 fathoms. (Garth, 1946).

Material examined: 12 specimens from 3, or possibly 4, localities:

Guatemala

7 mi. W. of Champerico, December 15, 1937, Station 197, D-1, 14 fathoms, 2 males, 1 ovigerous female.

El Salvador

La Libertad, December 16, 1937, Station 198, D-1, 13 fathoms, 1 female, 5 young.

Nicaragua

Monypenny Point, Gulf of Fonseca, December 24, 1937, Station 199, D-6, 4 fathoms, 1 female.

Incertae sedis

Locality and date unknown, 1 young male, soft shell, 1 ovigerous female.

Measurements: Males from 19.5×18.3 to 24.5×23.5 mm., females from 15.2×13.8 to 25.3×24.0 mm., ovigerous females from 20.3×19.5 (rostrum broken) to 25.3×24.0 mm., all measurements without posterior spine.

Habitat: Exclusively mud.

Breeding: Guatemala in mid-December.

Remarks: Since the Saboga Island, Panama, specimens reported by Boone (1930) are of another genus and species (see synonymy for *Iliacantha hancocki* Rathbun), additional records for the true *Persephona edwardsii* from Central American localities, such as the three above, assume added significance. The two species share three posterior carapace spines, but here the resemblance ceases. The carapace of *P. edwardsii* is granulate and the chelipeds relatively massive as compared to the smooth carapace and attenuated chelipeds of the *Iliacantha* species.

***Persephona townsendi* (Rathbun)**

Myra townsendi Rathbun, 1893, p. 255.

Persephona townsendi, Rathbun, 1898, p. 613; 1937, p. 160, pl. 42, fig. 1, pl. 43, fig. 1. Crane, 1937, p. 104. Garth, 1948, p. 18.

Range: From off Punta San Fermin, Gulf of California, Mexico, to off Cape Pasado, Ecuador. 2-58 fathoms. (Garth, 1948).

Material examined: 5 specimens from 4 stations:

Mexico

17 mi. SE x E of Acapulco, November 29, 1937, Station 189, D-4, 28 fathoms, 1 male.

4 mi. SSW of Maldonado Point, November 30, 1937, Station 192, D-1, 26 fathoms, 1 female.

Costa Rica

Cedro Island, Gulf of Nicoya, February 13, 1938, Station 213, D-1 to D-10, 4-10 fathoms, 1 young male.

Golfito, Gulf of Dulce, March 9, 1938, Station 218, D-8, 6 fathoms, 1 female, 1 young.

Measurements: Males from 10.2×9.3 to 15.2×14.0 mm., females from 10.4×9.8 to 19.9×18.9 mm., young from 9.0×8.3 mm., all measurements without posterior spine.

Habitat: Mud; often with sand, crushed shell, or mangrove leaves.

Color in life: Of Maldonado Point, Mexico, male: Carapace cream marbled with red. (J. Crane, field notes).

***Leucosilia jurinei* (Saussure)**

Guaia (Ilia) jurinei Saussure, 1853, p. 65, pl. 13, figs. 4-4b.

Leucosilia jurinii, Bell, 1855, p. 295, pl. 32, fig. 1.

Leucosilia jurinei, Rathbun, 1910, p. 552, pl. 45, fig. 1; 1937, p. 170, pl. 48, figs. 1-8. Garth, 1946, p. 358.

Range: From Mazatlan, Mexico, to Sechura Bay, Peru.

Material examined: 16 specimens from 3, and possibly 4, localities:

Nicaragua

Castenones, near Corinto, January 5, 1938, 1 ovigerous female.

Costa Rica

Port Parker, January 13, 1938, shore, 3 males, 1 female.

Panama

Bahia Honda, March 16, 1938, 7 males, 3 ovigerous females.

Incertae sedis

Locality and date unknown, 1 large male, encrusted with bryozoans.

Measurements: Males from 8.5×7.8 to 20.4

×19.6 mm., females from 7.3 × 7.2 to 18.1 × 16.4 mm., ovigerous females same.

Breeding: Nicaragua in early January; Panama in mid-March.

Habitat: Since no mention is made of depth with any specimen, it is assumed that the specimens listed above were collected ashore. That *Leucosilia jurinei* is not strictly an intertidal species, however, is attested by specimens from Sechura Bay, Peru, in Hancock collections that were taken in 9.5 fathoms.

***Randallia ornata* (Randall)**

Illa ornata Randall, 1839, p. 129.

Randallia ornata, Stimpson, 1857, p. 85. Rathbun, 1937, p. 172, pl. 49, figs. 1, 2, and synonymy. Not *R. ornata*, Boone, 1930, p. 59, pl. 12.

Range: From Mendocino County, California, to Magdalena Bay, Lower California, Mexico. 5.5-51 fathoms. (Rathbun).

Material examined: E of Cedros Island, Lower California, Mexico, March 27, 1936, Station 126, D-1 to D-7, 38-48 fathoms, 1 female.

Measurements: Female specimen, length 21.6 mm., width 20.1 mm., without spines.

Habitat: Not given.

Color in life: Carapace pale buff mottled heavily with vinaceous purple (Ridgway: bordeaux). Mottling heaviest on posterior gastric and upper branchial regions, almost absent on intestinal [region]. Mottling interspersed with fine apricot buff dots; these dots also present on intestinal [region]. Basal three-fourths of merus of cheliped solid apricot buff, a large bordeaux splotch at distal upper end of merus. Carpus, manus, and dactylus white with a fine dusting of purplish and buff on upper surface of carpus and manus. Legs white except for purple patch at distal upper end of each merus. Underside pure white. (J. Crane, field notes).

Behavior: When dropped on mud in an aquarium, [the crab] immediately dug itself in, sinking [its] hind end first, then pressing [its] anterior portion and chelipeds under until the rostral region [was] completely covered. Then emerged the rostrum and the eyes, the former remaining mud covered because of the fine granules in this region. (J. Crane, field notes).

Remarks: Of the several *Randallia* species taken by the "Zaca," *R. ornata* alone is temperate, not tropical, allying itself with the fauna of California-Lower California, and having as its Gulf of California cognate *R. angelica* Garth. The record of Boone (1930) from Punta Arenas, Costa Rica, is in error. (See synonymy under *R. bulligera* Rathbun).

***Randallia bulligera* Rathbun**

Randallia bulligera Rathbun, 1898, p. 614, pl. 44, fig. 6; 1937, p. 176, text-fig. 38, pl. 50, figs. 1, 2.

Randallia ornata, Boone, 1930, p. 59, pl. 12. Not *R. ornata* Randall.

Range: From Magdalena Bay, Lower California, Mexico, to Callao, Peru. 2-28 fathoms.

Material examined: 66 specimens from 5 stations:

Mexico

Port Guatulco, December 7, 1937, Station 195, D-19, 17 fathoms, 1 male, 9 young; D-21, Santa Cruz Bay, 18 fathoms, 1 male, 26 young.

Tangola-Tangola Bay, Station 196, December 9, 1937, D-6, 7 fathoms, 1 ovigerous female; December 13, 1937, D-16, 16 fathoms, 2 males, 2 females; D-17, 23 fathoms, 1 female, 3 young.

Guatemala

7 mi. E of Champerico, December 15, 1937, Station 197, D-1, 14 fathoms, 2 males, 3 ovigerous females; D-2, 14 fathoms, 3 males, 1 ovigerous female.

El Salvador

La Libertad, December 16, 1937, Station 198, D-1, 13 fathoms, 1 male; D-2, 14 fathoms, 1 male, 1 female.

Meanguera Island, Gulf of Fonseca, December 23, 1937, Station 199, D-1, 16 fathoms, 3 males, 6 females (4 ovigerous).

Measurements: Males from 5.8 × 5.5 to 12.5 × 11.8 mm., females from 7.1 × 6.8 to 12.4 × 12.0 mm., ovigerous females from 7.1 × 6.8 to 10.8 × 10.6 mm., young from 2.7 × 2.7 mm.

Habitat: Predominantly mud; occasionally with sand or crushed shell.

Color in life: Of Gulf of Fonseca, El Salvador, specimens: Brightest burnt orange with rose red tubercles, under parts and distal part of chelae white. Other specimens paler, buff with deeper buff or pink tubercles. Eggs scarlet orange. Crane (field notes) adds that the difference between bright and pale specimens is not due to sex, there being bright and pale specimens of both sexes.

Breeding: Mexico, Guatemala, and El Salvador, early to late December.

Remarks: The smallest specimens, including ovigerous females, were found at the most southerly locality, the largest at the most northerly. Young have erect granules that are almost spinules; old specimens are bryozoan encrusted.

***Randallia agaricias* Rathbun**

Randallia agaricias Rathbun, 1898, p. 614, pl. 44, figs. 7, 7a; 1937, p. 178, text-fig. 40, pl. 50,

figs. 3, 4. Garth, 1946, p. 359, pl. 62, fig. 2.

Range: From Thurloe Bay, Lower California, Mexico, to La Libertad, Ecuador. Galapagos Islands. 3-55 fathoms. (Garth).

Material examined: 5 specimens from 3 localities:

Mexico

Magdalena Bay, Lower California, March 29, 1936, 1 ovigerous female.

Costa Rica

Port Parker, Station 203, January 20, 1938, D-2, D-3, 10-12 fathoms, 2 ovigerous females; January 22, 1938, D-11, 2-4 fathoms, 1 female.

Colombia

Gorgona Island, March 31, 1938, Station 232, D-1, 2-8 fathoms, 1 male.

Measurements: Male 6.7×6.4 mm., non-ovigerous female 7.2×7.3 mm., ovigerous females 6.4×6.5 mm. to 7.7×7.7 mm.

Habitat: Shelly sand, mud, algae; rocks; sand.

Breeding: Lower California and Colombia in late March; Costa Rica in late January.

Remarks: "Zaca" specimens lack the mushroom tubercles said by Rathbun to be characteristic but agree with specimens in Hancock collections reported by her as of this species.

Randallia minuta Rathbun

Randallia minuta Rathbun, 1935, p. 2; 1937, p. 179, pl. 84.

Range: From Puerto Culebra, Costa Rica, to Secas Islands, Panama. 10-15 fathoms.

Material examined: Piedra Blanca Bay, Costa Rica, February 5, 1938, Station 208, D-[1 to 10], [2-6 fathoms], 1 female.

Measurements: Female specimen, length 4.3 mm., width 4.1 mm.

Habitat: Rocks, sand, algae.

Remarks: The specimen above is the first to be recorded since the male type and an ovigerous female were obtained in 1934 by the *Velero III*. A slight clarification of the type locality as recorded by Rathbun (1935) should be made: the "isles in bay" around which dredging was done at Puerto Culebra by the *Velero III* were the South Viradores Islands; the depth of Station 257-34 was 10 fathoms.

Iliacantha hancocki Rathbun

Iliacantha hancocki Rathbun, 1935, p. 2; 1937, p. 187, pl. 57, figs. 1, 2. Garth, 1948, p. 18.

Persephona edwardsii, Boone, 1930, p. 53, fig. A. Not *P. edwardsii* Bell.

Range: From Santa Maria Bay, Lower Cali-

fornia, Mexico, to Cape Santa Elena, Ecuador. 5-40 fathoms. (Garth, 1948).

Material examined: 12 specimens from 6 stations:

Mexico

4 mi. SSW of Maldonado Point, November 30, 1937, Station 192, D-1, 26 fathoms, 1 male.

Port Guatulco and Santa Cruz Bay, December 7, 1937, Station 195, D-20, D-21, 23-18 fathoms, 2 ovigerous females.

Costa Rica

Port Parker, January 20, 1938, Station 203, D-2, D-3, 10-12 fathoms, 3 young.

Off Ballenas Bay, Gulf of Nicoya, February 25, 1938, Station 213, D-15, D-16, 40-45 fathoms, 1 male, 1 female; D-17, 35 fathoms, 1 male.

14 mi. S x E of Judas Point, March 1, 1938, Station 214, D-1, D-3, D-4, 42-61 fathoms, 1 male, 1 female.

Panama

Gulf of Chiriqui, March 13, 1938, Station 221, D-4, 38 fathoms, 1 female.

Measurements: Males from 18.3×15.6 to 32.9×28.1 mm., females from 15.3×13.2 to 33.0×29.1 mm., ovigerous females 28.7×25.5 and 29.0×25.7 mm., young from 5.8×5.2 mm. All measurements without posterior spine.

Habitat: Mud; shelly sand, mud, algae; mud, shell, rocks.

Color in life: Of Maldonado Point, Mexico, male: Regular coloring. (J. Crane, field notes). This may refer to absence of pattern. (J. G.)

Breeding: West coast of Mexico in early December.

Remarks: The above series contains specimens of both sexes of a size larger than the 23.4×20.6 male holotype, the only specimen of which measurements are given by Rathbun (1937).

Iliacantha schmitti Rathbun

Iliacantha schmitti Rathbun, 1935, p. 2; 1937, p. 192, text-fig. 42, pl. 83, figs. 1, 2. Garth, 1961a, p. 121.

Range: From Point Tosco, Lower California, and Angel de la Guarda Island, Gulf of California, Mexico (Garth, 1961a), to La Plata Island, Ecuador. 10-150 fathoms. (Rathbun, 1937).

Material examined: 4 specimens from 2 stations.

Costa Rica

14 mi. S x E of Judas Point, March 1, 1938, Station 214, D-1, D-3, D-4, 42-61 fathoms, 2 females.

Panama

Hannibal Bank, March 20, 1938, Station 224, D-3, 35 fathoms, 1 male, 1 female.

Measurements: Male 33.1×29.8 mm., females from 15.0×13.6 to 32.6×29.0 mm. All measurements without posterior spine.

Habitat: Mud, shell, rocks; sand, shells, algae.

Remarks: This species and the more abundant *Iliacantha hancocki* were taken in the same dredge haul at Hannibal Bank. Of the two species, *I. schmitti* has the more attenuated chelipeds, the fingers alone being one and one-half times the upper margin of the palm. It was noted that the margin connecting the posterior spines is visible in dorsal view in the female only, and not in the male, as would be assumed from the diagnosis given by Rathbun (1937).

The two localities above are well north of the Colombia-Ecuador range recorded by Rathbun (1937) and would represent an outright extension were it not for the fact that *I. schmitti* was found by Hancock Expeditions to occur extensively in the Lower California-Gulf of California region (Garth, 1961a). The "Zaca" Expedition records serve to define the southern portion of an apparently discontinuous range, and to extend it northward to Judas Point, Costa Rica.

Family CALAPPIDAE

Calappa convexa Saussure

Calappa convexa Saussure, 1853, p. 362, pl. 13, fig. 3. Rathbun, 1937, p. 206, pl. 52, figs. 1-3.

Garth, 1946, p. 360, pl. 62, fig. 6; 1948, p. 19.

Range: From Magdalena Bay, Lower California, Mexico, to Santa Elena Bay, Ecuador. Galapagos Islands. 0-32 fathoms. (Garth, 1948).

Material examined: 5 specimens from 4 stations:

Mexico

Port Guatulco, December 6, 1937, Station 195, D-10, D-11, 4-5 fathoms, 1 young.

Tangola-Tangola Bay, December 9, 1937, Station 196, D-6, 7 fathoms, 1 young.

Costa Rica

Port Parker, January 22, 1938, Station 203, D-10, 6-2.5 fathoms, 1 female, 1 young.

Piedra Blanca Bay, February 5, 1938, Station 208, dredges [D-1 to D-10], 2-6 fathoms, 1 young.

Measurements: Female specimen 19.3×24.5 mm. Young from 4.5×5.0 to 9.8×11.3 mm.

Habitat: Gravelly sand, crushed shell, dead coral; rocks, sand, and algae. Fairly common in 12 feet on sand near rocks, according to pilot.

Natives catch in hands by diving. Good to eat. (J. Crane, field notes).

Color in life: Lavender spotted finely with white. Inside of cheliped orange. Ambulatories and chelipeds spotted with yellow and mottled with white and lavender. (J. Crane, field notes, of large commercial *Calappa* bought in Aca-pulco market. Specimen not seen by the writer but said to be the same as Port Guatulco and Tangola-Tangola species).

Remarks: Since the young of *Calappa convexa* are narrow like *C. saussurei*, rather than wide like the adults, reliance must be placed on characters other than relative width to length in separating immature specimens of the two species. Of these the less tuberculate posterior third of the carapace and lower third of the outer surface of the palm of *C. convexa*, with granules horizontally aligned in both instances, proved most useful.

Calappa saussurei Rathbun

Calappa saussurei Rathbun, 1898, p. 609, pl. 41, fig. 6; 1937, p. 206, text-fig. 43, pl. 63, figs. 1-4. Finnegan, 1931, p. 611, fig. 1. Crane, 1937, p. 98. Garth, 1948, p. 19; 1961a, p. 121.

Range: From Point Tosco, Lower California, and Puerto Refugio, Gulf of California, Mexico (Garth, 1961a), to La Plata Island, Ecuador. 7-150 fathoms. (Garth, 1948).

Material examined: 11 specimens from 6 stations:

Mexico

Gorda Banks, Gulf of California, November 13, 1937, Station 150, D-27, 60 fathoms, 1 male, 1 young female.

Manzanillo, November 22, 1937, Station 184, D-2, 30 fathoms, 2 males.

Nicaragua

Corinto, Station 200, December 29, 1937, D-4, D-6, 0.5-2.5 fathoms, 2 young; January 5, 1938, D-15, 1 fathom, 1 young.

Costa Rica

14 mi. S x E of Judas Point, March 1, 1938, Station 214, D-4, 61 fathoms, 1 male, 1 female.

Panama

Gulf of Chiriqui, March 13, 1938, Station 221, D-3, 35 fathoms, 1 male.

Hannibal Bank, March 20, 1938, Station 224, D-3, 35 fathoms, 1 female.

Measurements: Males from 23.0×27.1 to 34.5×42.3 mm., females from 19.2×22.3 to

34.8 × 42.6 mm. (spines broken), young from 3.8 × 3.9 to 10.2 × 12.0 mm.

Habitat: Sand, gravelly sand; mud, sandy mud; rocks; sand, shells, algae; mangrove leaves.

Color in life: Of Gorda Banks specimens: Small specimen: Pale tan, tubercles coral pink. Large specimen: Pinkish all over; tubercles coral as above. (J. Crane, field notes).

Of Manzanillo, Mexico, males: Pale phase. (J. Crane, field notes).

Remarks: For food, breeding, and behavior see Crane (1937, p. 99).

Mursia gaudichaudii (Milne Edwards)

Platymera gaudichaudii Milne Edwards, 1837, p. 108.

Mursia gaudichaudii, Schmitt, 1921, p. 190, text-fig. 118. Rathbun, 1937, p. 220, pl. 66, figs. 1-3, pl. 67, figs. 1-6. Crane, 1937, p. 99. Garth, 1946, p. 361, pl. 62, figs. 3, 4.

Mursia gaudichaudi, Garth, 1957, p. 16, synonymy.

Range: From Gulf of the Farallones, California, to Talcahuano, Chile. Galapagos Islands. 20-218 fathoms. (Garth, 1957).

Material examined: 2 specimens from as many stations:

Mexico

E of Cedros Island, Lower California, Mexico, November 10, 1937, Station 126, D-14, 45 fathoms, 1 young female.

Tangola-Tangola Bay, December 13, 1937, Station 196, D-19, 30 fathoms, 1 male.

Measurements: Male 30.4 × 56.8 (44.0) mm., young female 11.2 × 15.1 mm. without lateral spine.

Habitat: Mud, algae.

Color in life: Carapace and chelipeds olive tan. Tubercles and spines rich chestnut. Underparts pure white. Dactyls tipped with coral pink. (J. Crane, field notes). See also Crane (1937, p. 100).

Remarks: The species enjoys the greatest latitudinal range of any eastern Pacific brachyuran and a correspondingly great bathymetric range as well.

Cycloes bairdii Stimpson

Cyclois bairdii Stimpson, 1860, p. 237.

Cycloës bairdii, Rathbun, 1898, p. 610; 1937, p. 225, pl. 69, figs. 3, 4. Finnegan, 1931, p. 613. Crane, 1937, p. 100. Garth, 1946, p. 362, pl. 62, figs. 7, 8; 1948, p. 19; 1961a, p. 121.

Range: From Santa Maria Bay, Lower California, and Los Frailes, Gulf of California, Mex-

ico (Garth, 1961a), to La Libertad, Ecuador. Galapagos Islands. 2-70 fathoms. (Garth, 1948). Occurs also in the Atlantic.

Material examined: 132 specimens from 10 stations:

Mexico

3 mi. off Pyramid Rock, Clarion Island, May 12, 1936, Station 163, D-2, 55 fathoms, 3 males, 1 female.

Chamela Bay, November 17, 1937, Station 182, D-4, 16 fathoms, 1 male, 1 young.

Tenacatita Bay, November 21, 1937, Station 183, D-1, 15 fathoms, 1 female.

Port Guatulco, Station 195, December 4, 1937, D-3, 3.5 fathoms, 1 young; December 5, 1937, D-6, D-7, D-9, 3 fathoms, 3 young; December 6, 1937, D-10, D-11, 4-5 fathoms, 1 male, 1 female, 6 young; December 7, 1937, D-16, D-17, 6-10 fathoms, 1 male, 5 young; D-19, 17 fathoms, 1 young.

Tangola-Tangola Bay, Station 196, December 9, 1937, D-1, D-5, D-6, D-8, 5-9 fathoms, 1 male, 23 young; December 12, 1937, D-9 to D-14, 4.5-10 fathoms, 1 male, 8 young; December 13, D-16, 16 fathoms, 3 males, 3 females, 24 young.

Costa Rica

Port Parker, January 22, 1938, Station 203, D-4, 7 fathoms, 1 young; D-12, 2 fathoms, 1 young female.

Murcielago Bay, January 23, 1938, Station 204, D-1, D-2, D-4, 4-2 fathoms, 5 young.

Port Culebra, January 30, 1938, Station 206, D-2, 14 fathoms, 1 female, soft shell.

Piedra Blanca, February 5, 1938, Station 208, [D-1 to D-10], 2-6 fathoms, 5 young.

Colombia

Gorgona Island, March 31, 1938, Station 232, D-1, 2-8 fathoms, 30 young.

Measurements: Males from 11.2 × 11.8 to 31.0 × 32.3 mm., females from 11.7 × 11.8 to 32.3 × 32.8 mm., young from 4.1 × 4.2 mm. None of the females is ovigerous.

Habitat: Sand, gravelly sand; mud, gravelly mud, sandy mud; sand or gravel with algae; crushed shell; dead coral.

Color in life: Of Chamela Bay, Mexico, specimens: General color light chestnut; carpus, manus, and dactyls of ambulatories of larger specimen violet. Inner side of carpus, manus, and dactyls of cheliped streaked with orange and white in larger specimen; white with single large orange spot on inside of distal end of manus in smaller specimen. Underparts white. (J. Crane, field notes).

Of Port Guatulco, Mexico, young: Mottled brown and white; chelipeds white. (J. Crane, field notes).

Behavior: [When] kept in an aquarium, the larger [of the two Chamela Bay specimens] never buried itself; [it] paid no attention to dark, flashlight, or daylight, [it] scarcely moved but kept a fine stream of water shooting above its mouth straight upward to a distance of two and one-half inches. The smaller occasionally buried itself half way, hind end first; [it was] much more active than the larger. Both merged perfectly with the coarse sandy bottom with tiny shells. (J. Crane, field notes).

Remarks: Specimens of both sexes measured above are larger than the 29×29 mm. female taken by the "Zaca" at Arena Bank, Gulf of California (Crane, 1937), although not as large as the 45.8×49 mm. female recorded by Rathbun (1937).

Hepatus kossmanni Neumann

Hepatus kossmanni Neumann, 1878, p. 28.

Hepatus kossmanni, Rathbun, 1910, p. 593, part (Panama Bay); 1937, p. 239, pl. 72, figs. 3, 4. Crane, 1937, p. 101, pl. 1, figs. 5, 6. Garth, 1948, p. 20; 1961a, p. 121.

Range: From Abreojos Point, west coast of Lower California, and Angeles Bay, Gulf of California, Mexico (Garth, 1961a), to La Libertad, Ecuador. 2-25 fathoms. (Garth, 1948).

Material examined: 14 specimens from 6 stations:

Mexico

17 mi. SE x E of Acapulco, November 29, 1937, Station 189, D-2, D-4, 20-28 fathoms, 1 male, 3 females.

Tangola-Tangola Bay, December 13, 1937, Station 196, D-17, 23 fathoms, 1 female, with rhizocephalan.

Guatemala

7 mi. W of Champerico, December 15, 1937, Station 197, D-1, D-2, 14 fathoms, 2 females, 4 young.

El Salvador

La Libertad, December 16, 1937, Station 198, D-1, 13 fathoms, 1 male.

Costa Rica

Cedro Island, Gulf of Nicoya, February 13, 1938, Station 213, D-11, 8 fathoms, carapace fragment.

Golfito, Gulf of Dulce, March 7, 1938, depth not given, 1 male.

Measurements: Males 21.9×30.3 to 39.2×45.1 mm., females from 13.3×19.2 to 35.9×48.9 mm., young from 7.7×10.8 mm.

Habitat: Exclusively mud.

Color in life: Of Acapulco, Mexico, specimen: Carapace brown, formed of dark brown, very fine marblings on cream. Legs banded chestnut and white. Manus, dactyls, and underparts white. (J. Crane, field notes).

Remarks: Specimens from near Acapulco and from Tangola-Tangola Bay, Mexico, carried sea anemones as commensals. According to Crane (field notes) the anemone was in the exact center of the carapace of the two larger specimens from station 189. The largest female, also from this station, was almost smooth, not lumpy as is usual for the species.

Hepatella amica Smith

Hepatella amica Smith, 1869, p. 250, footnote. Rathbun, 1937, p. 247, pl. 76, figs. 1, 2.

Range: From Isabel Island, Mexico, to Cape San Francisco, Ecuador. 2-35 fathoms. (Rathbun).

Material examined: Port Guatulco, Mexico, December 5, 1937, Station 195, D-7, 4.5 fathoms, 1 young male.

Measurements: Male 7.8 mm. long, 10.1 mm. wide.

Habitat: Rocks.

Remarks: A second species, *Hepatella peruviana* Rathbun, 1933, occurs with *H. amica* in the southern portion of its range, from Panama to Ecuador, and continues to Peru. Neither species is common.

Osachila lata Faxon

Osachila lata Faxon, 1893, p. 159; 1895, p. 32, pl. 5, figs. 2, 2a, 2b. Rathbun, 1937, p. 257, fig. 45, pl. 78, figs. 1, 2. Crane, 1937, p. 100 (part: not the ovigerous female from Arena Bank), pl. 1, figs. 1, 2 (not figs. 3-4).

Range: From Santa Inez Bay, Gulf of California, to Chamela or Perula Bay, Mexico. 30-80 fathoms.

Material examined: Manzanillo, Mexico, November 22, 1937, Station 184, D-2, 30 fathoms, 6 males, 8 females, 1 young.

Measurements: Males from 22.5×28.7 to 30.6×40.4 mm., females from 18.0×23.1 to 25.0×31.9 mm., young specimen 7.0×8.9 mm.

Habitat: Gravelly sand.

Color in life: General tone . . . burnt sienna; rostrum, lower manus, fixed dactyl, and underparts white. Ambulatories banded chestnut and white. (J. Crane, field notes).

Remarks: As previously noted (Garth, 1946,

p. 366) only the male figured by Crane (1937, pl. 1, figs. 1, 2) is of this species, the figured female (*Ibid.*, figs. 3, 4) being of the following *Osachila levis*. The figure of the male has particular value, the specimen having been compared by Dr. F. A. Chace, Jr. with Faxon's then unique type.

Osachila levis Rathbun

Osachila levis Rathbun, 1898, p. 612; 1937, p. 254, pl. 78, figs. 3, 4. Garth, 1946, p. 365, pl. 62, fig. 5; 1961a, p. 121.

Osachila lata, Crane, 1937, p. 100 (part: the ovigerous female from Arena Bank), pl. 1, figs. 3, 4. Not *O. lata* Faxon.

Range: From Puerto Refugio, Gulf of California, Mexico (Garth, 1961a), to La Plata Island, Ecuador. Galapagos Islands. 12-80 fathoms. (Garth, 1946).

Material examined: Hannibal Bank, March 20, 1938, Station 224, D-2, D-3, 35 fathoms, 1 male, 6 females (3 ovigerous), 1 young.

Measurements: Male 21.0 × 24.5 mm., non-ovigerous females from 28.7 × 33.5 to 32.3 × 38.2 mm., ovigerous females from 32.2 × 38.4 to 37.9 × 45.0 mm., young (male) 12.6 × 14.4 mm.

Habitat: Rocks, mud, dead coral; sand, shells, algae.

Breeding: Three of the six females dredged at Hannibal Bank were in berry.

Remarks: Specimens of both sexes are considerably larger than the 19 × 21 mm. female holotype. (See also *Remarks* under the preceding and following species).

Osachila sona Garth

Osachila sona Garth, 1940, p. 56, pl. 12, figs. 1-4.

Range: Known only from the vicinity of Medidor Island, outside Bahia Honda, Panama, 30-50 fathoms. (Garth, 1940).

Material examined: Hannibal Bank, Panama, March 20, 1938, Station 224, D-2, 35 fathoms, 1 male, 3 females, 1 young.

Measurements: Male 17.2 × 21.5 mm., females from 30.1 × 37.8 to 35.6 × 46.4 mm., young 10.2 × 12.5 mm.

Habitat: Rocks, mud, dead coral. Encrusted with coralline algae and bryozoans.

Remarks: The three females from Hannibal Bank are all larger than the 20.0 × 25.5 mm. female holotype, the single male larger than the 14.0 × 17.3 mm allotype, with which they were compared. They were segregated from a more extensive series of *Osachila levis* Rathbun, found in the same dredge haul, by their greater pro-

portionate breadth to length, their rougher carapace and dorsal leg surfaces, and their more advanced and strongly denticulate anterolateral margins. It was also noted that the two species were in a different phase of the breeding cycle, three of the six female *O. levis* being in berry, whereas none of the *O. sona* females carried ova.

To the six points distinguishing *Osachila sona* from its nearest relative, *O. galapagensis* Rathbun (Cf. Garth, 1940, p. 58), a seventh should be added: (7) The dactyls of the ambulatory legs have paired inferior laminae, while in the Galapagos species these laminae are lacking.

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